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INAUGURAL ADDRESS.

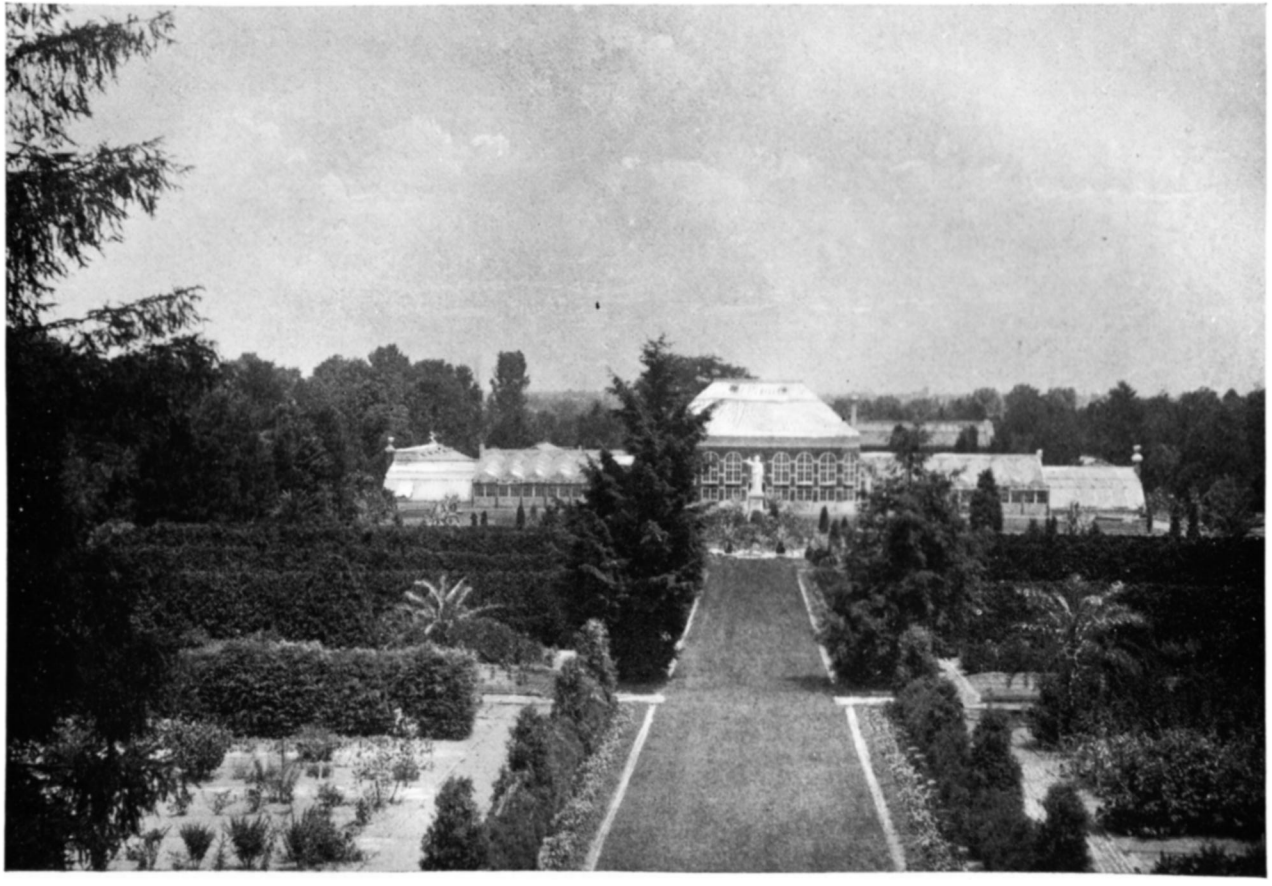
BY PROFESSOR WILLIAM TRELEASE.

In its conception, the new School of Botany is representative of the spirit of the nineteenth century, the hope of its founder being that it may not only advance the science of botany, but prove useful in the pursuits of practical life to which that science can be made to contribute. To realize this hope, the school should, from the first, be governed with a comprehensive knowledge of the possibilities of botanical work, and a clear understanding of the conditions which favor and oppose it in America, and especially in this great Mississippi Valley, in which we are located.

While it would be premature to make this inaugural a statement of plans, no better opportunity will offer for a consideration of the elements upon which the usefulness of the school must largely depend. Foremost among these is the growing demand for able instruction.

Popular education, and a development of that love of the beautiful in nature which has so long been near the heart of Mr. Shaw, in the creation and maintenance of the magnificent garden and arboretum of which every resident of this favored city is justly proud, are foremost among the objects of the new school which is to enjoy these advantages. I have no doubt this part of our work is more comprehensive than it would at first be thought, by one not a botanist. When the word botany is mentioned, the most common idea that it calls up is — learning the names of plants. A mutual knowledge of plant names is a prerequisite to the exchange of ideas between botanists, and the acquisition of this knowledge is of the greatest importance; yet the study of elementary botany includes much more than this.

In planning educational courses in elementary botany, work of this character cannot be overlooked; yet the time that can be given to a short course in one of the sciences



THE MAIN TURF WALK.

by undergraduate students is always limited. To best utilize that which is available is a problem that is now engaging the best thought of the most experienced men. At best, the student leaves the class-room with little knowledge; but if his time has been wisely occupied he carries with him a disciplined mind and trained hand with which it can be increased if opportunity offers.

Even the younger botanists recollect the time when systematic botany, and, indeed, that branch of systematic botany which deals with the flowering plants and ferns, was nearly all that was taught in our schools and colleges. What attention was given to the structure and mode of life of these plants was incidental, and mainly taught as a necessary preparation for systematic work. The older persons who followed Eaton or Mrs. Lincoln over this ground, or the younger generation to whom the path has been made easier by Gray and Wood, will agree with me that to a bright student this is fascinating and profitable work. To know the flowers found on a spring or autumn walk as old friends, to call them familiarly by name, and to make each stroll the means of adding to one's acquaintanceship, adds not a little to the pleasure of living. Yet that this knowledge appeals to the emotions in the pleasure it gives, repels some of our unemotional American youth, to whom the study of botany has become somewhat of an accomplishment — a girls' study. I am reluctant to believe that these are, or ever will be, in the majority.

The fact is, nevertheless, patent that the student who is limited to the contemplation of this side of botany, has but a limited knowledge of the subject. Too often, it must be confessed, the name of a plant is all that he cares for. To have the branches of a dichotomous key well in hand, like the leash of a brace of beagles, wherewith to run the unlucky plant he comes across, through numerous turns and windings, to its place in the system, like a timid hare to his burrow, affords a safe and harmless excitement, and forms a necessary part of a botanical equipment; but it is not

strange that the student to whom this is the ultimatum should be sometimes thought lightly of, and his attainments regarded as of little value. The question of time, however, precludes the addition of other subjects to this, if anything like proficiency in any of them is desired, as it should be in any course that is worthy of being taught.

Within a generation a younger school of botanists — younger, but already with graying locks — has sought to avoid the faults of their predecessors by a very different plan of work. So far as the English-speaking world is concerned, this school may be said to date from the organization of the South Kensington courses, under the direction of Professor Huxley. Instead of devoting his time to a class-room study of the theoretical organography of plants, supplemented by the examination, in the laboratory, of the more obvious characters that can be made out by the naked eye or with the aid of a hand lens, the student is initiated at once into the mysteries of the compound microscope, and learns at the start that the yeast we use to raise our bread and the bacteria that swarm in turned broth, are plants. His ideas of the limits of botany are, of necessity, broadened. He is successively carried through the study of representatives of the principal groups of the Vegetable Kingdom, seeing with his own eyes and recording by detailed description and faithful drawings, not only their external characters, but their minute structure. He learns at once how to use the microscope and how to prepare objects for microscopic examination; and the simpler experiments for demonstrating the mode of life — the physiology, of each plant studied, are not omitted.

Let us contrast the students who have respectively followed these two methods. The first has acquired the use of the penknife, the needle and the pocket magnifier. His notion of the Vegetable Kingdom is restricted; but when he sees a flowering plant he knows it or can identify it. More than this, he can generally tell what it is good for. He has, as you might say, a speaking acquaintance with nearly

everything that he recognizes as a plant. The second has acquired more manual dexterity. "A plant" means more to him. His eyes are opened to much in nature that would otherwise have escaped him; but I doubt if he will find more enjoyment in the pursuit of botany after leaving college than the first. He distinguishes a phaenogam from a cryptogam, an alga from a fungus, a schizophyte from one of the Saccharomycetes, by scientific characters; but when he gets into the world, he cannot identify the lower plants for want of a microscope and adequate books; nor, often, the higher plants for want of ability to use the better books at his command.

With a love for microscopic work, and a prejudice in favor of the latter method, I confess to a suspicion that if either must be accepted, to the rejection of the other, the old course, with certain modifications, is the better for a mixed class of beginning students. The nature of these modifications is a subject for study. Besides those features of structure which are essential to their correct identification, there is much of interest that can be learned from an examination of our commonest wild flowers and weeds, even without resorting to the microscope.

In the brief course of evening lectures to which this is preparatory, I shall endeavor to show what a wonderful interdependence there is between plants and certain animals, chiefly insects; and how influential these despised creatures have been in adorning the most beautiful and fragrant flowers with the charms for which we prize them most. The behavior of seedlings during germination, the ways in which some plants climb to the light over the trunks of their more robust neighbors, and the curious habit of others of preying upon insects, are easily studied. These have been called Darwinian subjects. They have occupied the attention of the great naturalist, but they are within the reach of any person with good powers of observation, and tend to strengthen these powers.

There is reason to suppose that in a city with the population of St. Louis, where there is a demand for intellectual pursuits, many persons are to be found who, while not otherwise connected with the University or other institutions of learning, will be glad to profit by the advantages for botanical study that the University is now able to offer. The study of systematic botany is capable of being made more than usually attractive here, where the spring opens early, and the flora is unusually rich and varied; while the treasures of the Botanical Garden, supplementing the wealth of floral forms that occur spontaneously, facilitate the acquisition of a comprehensive knowledge of the families of plants which are likely to attract attention or excite interest. With the coming of fall, the predominance of an entirely different class of vegetation, characterized by the abundance of golden-rods, asters and other Compositæ, changes the aspect of the flora materially, so that the work can very profitably be renewed then where it was interrupted by the heat of summer; nor need it be terminated by the coming of frost, for many exotics bloom largely, or exclusively, during the winter season. The study of ferns and grasses, two of the most interesting groups, is made quite as profitably from dried specimens as from fresh plants, and can be taken up with profit when other material fails. These groups, especially the ferns and grasses, form a most desirable subject for winter study.

While there are circumstances attending the beginning of the new department, which prevent the attempt to organize a class to run through the entire winter, this year, an effort will be made to open a laboratory at once for the study of these groups until the holidays; and provision is being made for the reception of a class in analytical work for the last eight or ten weeks of the college year, for the benefit of all persons who feel an interest in this study, whether connected with the University or not. Such a class need not of necessity be large. The character of its work is to be measured not so much in bulk as in quality; but if I do

not misjudge, the beginning that is made this year will be reasonably satisfactory in its results, while much more can be hoped for when corresponding classes are organized at the end of the next summer vacation.

The study of science must have a beginning. While we may not unanimously agree that this shall be in the kindergarten or the primary school, the reaction that is now succeeding that long period devoted almost exclusively to classical studies, is giving scientific and technical branches a prominent place in even the common schools. This being the case, we desire that the new School of Botany may be useful in adding to the zeal of the large number of teachers in the schools of this city and in the surrounding States who are called upon to teach botanical classes; and especially in imparting to them the most successful methods of instruction and interesting them in the pursuit of knowledge beyond the limits of the text-book or the schedule.

Within a decade, almost, the word biology — the science of life — has come into general use, yet to-day the better institutions of learning throughout the country vie with each other as to which shall give the most and the most thoroughly disciplinary training in this study of the structure and the life processes of animals and plants. To prepare the student for the practical use of the microscope and the intelligent interpretation of its revelations, and to fit him for advanced work in either vegetable or animal histology and physiology, no better course than this has yet been devised. Laboratory appliances for the most valuable botanical work of this character, and suitable instructional talent, will be provided as one of the first steps looking towards the development of the school.

The world is to-day awake to the desirability — I had almost said the necessity — of scientific training. Especially is this the case on the Continent of Europe, where Germany, in particular, sets an example of national liberality in the encouragement of education in all its branches,

that has not a little to do with the prominent place she holds and is destined to hold in the progress of the world. The recent address of Sir Lyon Playfair, at the Aberdeen meeting of the British Association for the Advancement of Science, shows that England, as represented by its men of broad learning and experience, realizes the advantages of such a system, upon the intelligent and conscientious development of which must largely rest her future. Yet the great British Universities, with the many lower schools that feed them, though inferior to those of Germany, are far in advance of institutions of a similar character on this side the Atlantic.

Aside from its utility in developing the faculties and enlarging the possibilities of enjoying life, the study of any science in its applications to the productive industries commends itself strongly to the reasoning man. Botany is one of the branches of widest applicability in the arts and manufactures.

So large a percentage of drugs and medicines is of vegetable origin, that botany is universally recognized as one of the most important branches in a pharamaceutical education. Notwithstanding great care, many mistakes occur in the collection and sale of drugs. I have in mind several such errors that have been brought to my notice within a few years. In the dried and broken drug, their rectification not infrequently taxes the skill of the expert, while their detection, absolutely required for the prevention of serious accidents, calls for a more than ordinarily thorough familiarity with not only the grosser botanical characters of medicinal plants, but with their minute structure.

The extent to which adulteration is practiced not only in medicines but more particularly in the food supplies which undergo a process of manufacture before coming into the hands of the consumer, renders the services of experts in its detection of frequent demand. The skill and training requisite here are far greater than in the examination of

crude products, since, aside from certain chemical reactions, the characters which must be relied on are determined only by a microscopic study of the suspected material. No part of applied botany is more fascinating, or calls for more intelligent application and thorough training than the study of food substances subject to adulteration and of the adulterants which, from their cheapness or ready attainability, are most frequently employed.

The time which is available for these studies in a school of pharmacy, and the numerous other duties which devolve upon the instructors, usually prevent the student from more than entering upon this field during his connection with it as an undergraduate; while very few graduates are so situated as to return for an advanced course. The duty, not only of employers but of clerks, is to acquire the greatest possible experience in this class of work. To enlist the attention of young men who propose to follow the calling of the pharmacist, should be a pleasant duty to every druggist who has the advancement of his profession at heart; and I have little doubt that, knowing the facilities for training that the School of Botany will offer, many employers in the city of St. Louis will see the wisdom of affording their clerks the command of a certain proportion of their time for its acquisition.

The value of a working knowledge of botany to the medical man has long been recognized, — never more than today. Indeed the science was long a medical science, and its present development is in part directly attributable to the labors of men who, like Dr. Engelmann, — whose loss is keenly felt not only in this, his home, but wherever thorough scientific work is appreciated, — have in their youth acquired the ability and fondness for investigation that in later years have prompted them to devote the odd moments of a busy professional life to the pursuit of a science that they loved.

The physician, no less than the pharmacist, profits by

a knowledge of the plants whose healing virtues he employs. While he may not be called upon so frequently to identify them, a familiarity with the relationships of plants not infrequently furnishes a key to their inherent properties, and is the foundation of the judicious experimental work by which new remedies are being brought into use every year. But to him the science of botany has a far broader significance. One of the earliest discoveries made by the aid of the microscope was that every drop of fermenting fluid, every minutest fragment of putrefying flesh or other organic solid, swarms with living things far too small to be seen by the unaided eye. The theory of spontaneous generation, which has for centuries been the cause of much disputation and many hard-fought battles of argument, having successively been proven untenable for the maggots which so promptly appear in putrefying animal matter, and for the rotifers, worms and infusoria, whose presence can always be predicted in fluids which contain decaying matter of vegetable origin, when exposed to the air, is still believed by many to find its support at or just beyond the limit of the microscope of to-day. Were not the futility of predicting a limit to the perfection of the instrument demonstrated by the failure of similar predictions that have been made from time to time, we might well inquire if the range of enlargement and the clearness of definition that have been attained by Zeiss, Tolles and Spencer, in the construction of their objectives can ever be surpassed; but if the future shall be at all commensurate with the past it is probable that the reading public will, within a comparatively short time, reject the spontaneous generation of the lowest organisms we now know, with as much certainty as they now declare against that of maggots. This theory, stimulating investigation, whatever error it may have been the means of promulgating, has in this way led to the discovery that, paradoxical as it may appear, death is often but a manifestation of life.

The lowest organisms whose life history nas been followed under the microscope, are bacteria. Plants, in their relationships, these minute beings, which are so small that many billions of some of the species could be brought within the space of a cubic inch, resemble animals in so far that they can derive their food only from organic matter; and in doing this they cause some of the most striking phenomena known to science. The decay of a piece of meat or an egg, the souring of a glass of milk, are so familiar to us that we accept them as realities without inquiring as to their cause. Modern science shows that these changes, in short, all that we commonly know as putrefaction or decay, are due to the development within the putrefying substance of myriads of bacteria; the malodorous and poisonous products that accompany decay being merely the waste matter excreted by them.

Bacteria are omnipresent. Wherever the path of a ray of sunlight can be seen in the air of a darkened room they exist. Wherever dust collects they are to be found. Dampness favors their propagation. Drought aids their dissemination. Throughout the universe nothing is more widely distributed, unless it be air. If these agents, small in themselves, but capable in the aggregate of producing so great effects, were confined to dead matter, they might not be entirely without merit. Disagreeable as decomposition may be in many of its manifestations, and harmful as it is in much of our every-day life, much that is worthless and unsightly is rapidly returned by it to begin the round of existence anew. The rancid change in butter may be unpleasant, but without essentially the same change cheese would not ripen from the curd. The souring of cider may please the taste of the veteran only, but without it our tables would be destitute of vinegar. If the results obtained by Schloesing and Muntz are to be accepted, the vegetation of the trees which shade our streets, the flowers with which our parks are adorned, and even the grass on which our cattle feed and the crops upon which we directly

rely for a great part of our food, could not exist were it not for the nitrification of the soil through the agency of certain bacteria. Within the year, no less an authority than Pasteur, in presenting a pupil's paper to the French Academy, which claimed to demonstrate that seeds cannot germinate in a soil entirely free from these microbes, as the French style them, even went so far as to assert that he has long held the opinion that not only the germination of seeds, but many of the functions both of plants and animals, depend upon their presence.

To the physician, the study of bacteria is of more than usual interest. Their history is, unfortunately, not one of benefit alone, nor of simple discomfort. All of them, from their organization, need organized matter for an important part of their food. While the majority of species claim this only after it has become effete, there are some which do not wait for death. A constant warfare is waged against them by all animate creation,—successful in many instances till death from some other cause puts an end to it, but unavailing in others.

The germ theory of disease has been so freely discussed in the public press that it is familiar, at least by name, to nearly every one who reads the daily papers. Nothing is at first thought more startling than the paradox that death from the dreaded zymotic diseases is the manifestation of a lower life within the patient; yet I do not hesitate to say that this is more than probable of many infectious diseases. To name a few is sufficient. Anthrax, small-pox, relapsing fever, and the various forms of pyæmia and septicæmia are of this nature. While the proof is not equally good, for them, diphtheria, erysipelas, typhoid and typhus fevers, yellow fever, and even the too familiar malarial diseases, are believed by able medical men to be germ diseases, and are almost universally treated by the profession on this basis. I do not doubt that consumption and other forms of tubercular disease, together with leprosy and cholera, should fall under the same category, though a perusal of the current litera-

ture shows a strong array of names among the opponents, as well as the supporters, of this proposition. But perhaps the conviction of Pasteur that hydrophobia is a germ disease, capable of being communicated by the microbes of artificial cultures, and, like small-pox and anthrax, preventable, to a certain degree, by a process comparable to vaccination, will be most surprising to the layman.

These are all diseases of man, though several of them are common to, or originate with, the domestic animals, like that dreaded and incurable disease of the horse, — glanders. Others of a similar character are confined to one or another of these animals. As examples, hog cholera, the chicken plague, and the Texas fever of cattle, may be named. The silk interest was at one time threatened with complete destruction by a germ disease of the worms. These diseases, and the list is far from exhausted, are said to result from, or are consequences of, a fermentation of living tissues corresponding to the putrefaction or similar changes which other bacteria cause in dead animal or vegetable matter. A certain class of them, including cholera and typhoid fever, are spoken of as filth diseases, from their frequent dissemination by contaminated drinking water. Certain it is, that the germs of many propagate in filth, and are never far from us; and the frequent insufficiency of quarantine shows how difficult the exclusion of others may be.

To know, so far as he may, the true nature of these germs or microbes, the manner of their development and reproduction, and the conditions of air, sewerage, food, drink and personal intercourse, which favor their propagation, and of the human body which render it susceptible to their attacks, as well as the means of circumventing or destroying them, is the duty of every young man entering the profession of medicine. Chairs of bacteriology are already being established abroad, and liberal sums are placed in the hands of experts for the purpose of investigating the subject of contagious diseases. In this country, lectures on bacteria and the germ theory of disease are given as an addition to

several medical courses, but the time to be spared from the regular curriculum is so limited that the student must usually be content with what can be imparted to him in the class-room, and knows the bacteria of even the commoner diseases only from wall-chart figures and the lecturer's description. While the busy practitioner cannot always find leisure for the use of his microscope, the career of men like Engelmann shows that where there is a will there is a way to do this, as other scientific work, at odd hours, and there are times when knowledge and training such as I speak of may be of value in the treatment of diseases which come under the hands of every physician.

Since this training cannot be given in the medical course, and the young graduate feels the impulse to begin the struggle for a lucrative and useful practice immediately on leaving his *alma mater*, it is clear that it should be provided for in preparatory courses. I do not believe I am promising too much, when I say that an indication that they will be utilized will call forth facilities in the School of Botany for the best work that a class of medical preparatory students are capable of, in the direct examination and cultivation of these microscopic beings which do so much good and work so much ill.

At the close of the war, Congress, realizing the great importance to the country of its agricultural interests, appropriated to the several States large grants of public lands, to endow colleges in which instruction in agriculture and the mechanic arts should be made a leading feature. The general feeling of the public appears to be that little has resulted from these grants, so far as agriculture is concerned. Whether this is true, we need not stop to inquire. The fact that the farmers of the country are discussing the management of the so-called agricultural colleges, that their representatives in the legislative bodies of a considerable number of States have established agricultural experiment stations, and that a movement is on foot to secure from the

national government enlarged means for the furtherance of the work of these stations, is, to one who reads the signs of the times, indicative of a desire to develop the science of agriculture, on the part of those who recognize its importance to the country.

Agriculture and horticulture are so closely related to botany that it is scarcely necessary to mention the dependence of the successful farmer, gardener, fruit-grower or florist, upon an intelligent understanding of, and conformity to, the laws of vegetable physiology in the operations of his every-day life. The nurseryman and florist are, perforce, botanists. To them a general knowledge of systematic botany, and that careful development of the powers of observation which a close study of the characters of plants gives, go far to assure success, when combined with shrewd business tact and a practical familiarity with the manual processes of their vocation.

While the farmer or gardener may require less of this knowledge, he should be well versed in forestry, and familiar with the weeds of the farm and roadside, and the most successful means of contending with them and repressing their advances. The reckless manner in which the most troublesome weeds are scattered from farm to farm, and from State to State, with clover and grass seed, necessitates a knowledge of their seeds, such as can be obtained only by careful study. If planning a course of botanical instruction for young men who intend to make the farm their home, I should give the study of weeds and of our native grasses and forest trees a prominent place in it.

Here, in the Mississippi Valley, the horticulturist contends with climatic conditions unknown in the East, or in the coast countries of Europe, whence we have received many of the valued varieties which we are trying — often in vain — to cultivate, as well as the methods of treatment by which we struggle for success. The coming fruit-grower must rely upon the teachings of botanical geography in the selection of varieties, and upon a most exact understanding

of the best methods of breeding and selecting new races of hardy parentage, if he would advance to that success which is ultimately hoped for in this changeable and severe climate. That the Missouri Botanical Garden and the School of Botany may be of the greatest utility in the development of this great home-creating and home-beautifying interest, is the expressed wish of their founder.

A subject still in its infancy in this country, and, indeed, but little advanced abroad, is that of plant disease. In the absence of reliable statistics, it cannot be said how great the aggregate loss from smut, mildew and similar causes is; but it must reach into the millions annually, in a country whose agricultural interests are so great as those of the United States. What a saving it would be if only a tithe of this loss could be prevented!

The study of plant diseases is botanical in more senses than one. Not only does a knowledge of vegetable physiology underlie it, but the most destructive diseases are, almost without exception, caused by parasitic plants of low organization.

Blight of the pear and apple is attributable to the growth of certain bacteria, which destroy the trees while feeding upon the starch contained in the young growth made by them. To barely enumerate the rusts, smuts, mildews and rots of our most valuable crops, would prove wearisome and would make an appalling list. Suffice it to say that nearly all are fungi. To rightly understand their nutrition, growth and propagation, and the varied forms in which many of them appear, when fruiting, is a long step toward controlling them and lessening their ravages. The grape mildew and rose mildew, now that their natural history is understood, are no longer the dreaded foes that they were a quarter of a century ago, and every educated gardener understands how to proceed to hold them in check. That they are superseded by more deadly and less tractable fungous diseases, should be but a stimulus to further study. No branch of botanical science is more enthusiastically

undertaken by advanced students of a practical turn of mind, than that relating to these parasites. Fortunately, or unfortunately, as you choose to regard it, these organisms are to be found in abundance about us, and, with a good library, we are now prepared to pursue this study to advantage.

Technical training is not complete without a knowledge of certain branches of botany. The engineer who is engaged in pioneer work must, of necessity, be well versed in forestry. To understand the manipulation of the microscope, and by its aid to recognize the innate cause of the difference between good and bad timber, adds intelligence to his work. The decay of timber, like the disease and death of plants, is usually the result of the insidious attacks of certain fungi, which destroy its structure in building up their own. Knowledge of the means of holding these destroyers in check, rests fundamentally upon an understanding of their life history and of the conditions which are favorable and inimical to them. We look, too, with some expectation, to direct botanical returns from a greater recognition of this department of science in technical training or, perhaps it would be better to say, preparatory to technical courses; for the young engineer or surveyor is not infrequently called by his duties into regions that are difficult of access, and have been but imperfectly explored botanically, and, knowing the simple means of preserving specimens for the herbarium, he is often in a position to render good service to the cause of science. Many most valuable collections have already been made by persons attached to surveying and exploring expeditions; but much still remains to be done in the less accessible parts of the country.

The immediate value of botanical knowledge to the explorer has been often demonstrated in the evil consequences that have attended the use of noxious plants under the impression that they were edible; and plants that are mild

and nutritious have quite as frequently been allowed to go unused, from ignorance, when wholesome food has been much needed.

The relation of botany to the fine arts need not be dwelt upon further than to say that some of the most attractive decorative designs are obtained from leaves, flowers and fruit. The prevalent tendency toward naturalism in decorative art finds encouragement and elevation in the close study of flowers and foliage that is made in the laboratory; while the minute structure of the higher plants, and the vegetative and reproductive organs of many of the cryptogams, as viewed under the microscope, suggest untold combinations of new features, of surprising elegance and beauty. In true art, even more than its practical applications, a familiarity with detail is often essential to success; and the artist whose landscapes and forest studies fail in fidelity in their presentation of the habit of trees, cannot hope for success in this direction, however brilliant he may be in execution. What an accurate knowledge of anatomy is to the painter of the human figure or of animals, a working familiarity with the bark, spray and leaf forms of trees is to the still-life student.

In the directions that have been thus imperfectly outlined, I have endeavored to show how broad the field for botanical instruction is, and it is not difficult to single out those lines which promise to result in much good if faithfully prosecuted. But instruction is by no means all of education, and far from all of university life proper; and it must not be forgotten that the School of Botany is organized as a University branch. To quote again from the address of Sir Lyon Playfair: —

> Universities are not mere storehouses of knowledge; they are also conservatories for its cultivation. Professors in a university have a higher function, because they ought to make new honey as well as to store it. The widening of the bounds of knowledge, literary or scien-

tific, is the crowning glory of university life. * * * Unless colleges have such ambition, they may be turned into mere mills to grind out material for examinations and competitions. Higher colleges should always hold before their students that knowledge, for its own sake, is the only object worthy of reverence. Beyond college life, there is a land flowing with milk and honey for those who know how to cultivate it.

Without fear of more than temporarily displeasing the patriotic American, whose pride of country is second to that of none, it may be said that Germany, with its usual zest in educational matters, leads the world in the quantity and quality of original work done by properly prepared students in her universities. I fear that it may be many years before we can hope for, much less claim, equality on this side the Atlantic, though the phenomenal progress which the Johns Hopkins University has made in the establishment of popular and productive post-graduate departments warrants the greatest caution in making such a prediction. The avenues to successful business or professional pursuits are open earlier to the American than to the citizen of an old-world country; and there is far less of the leisure for further study and improvement that attends the patient waiting for an opening in life that is required of the German youth. Positions of trust, even the judge' s bench and the professor's chair, often come unsolicited with us, when the incumbent should, and, were it not for the temptation before him, would occupy the position of a learner.

It has been said by one of America's most accomplished specialists, that the great need of American science is educated specialists, — men who, on the foundation of a liberal education, have reared that superstructure of training in the technique and literature of the specialty they espouse which shall equip them for the performance of rigidly accurate investigation; and that mental discipline and knowledge that shall enable them to comprehend and apply with a large understanding, the result of their labor. To be instrumental in training such specialists, and to assist them in doing original work, should be the highest aspiration of a teacher; to do it well, is the greatest service that he can render.

Many colleges offer courses of instruction for undergraduates and for graduate students that we may profitably copy to a greater or less degree in planning our work. In not a few, the value of original research on the part of both students and teachers is fully recognized. But the chair of botany in most American colleges is combined with some other department — frequently more than one — and, under the pressure of other and imperative calls for money, it is usually but feebly supported, and is developed only to the extent to which it is useful in the undergraduate courses. This renders the training of advanced students possible in few instances, while the opportunities for original work are often meager. Thanks to the far-sighted liberality of Mr. Shaw, we shall be able to provide the library, material, and laboratory appliances for work of this nature as they are needed.

Popular judgment of the new school must, of necessity, be based largely upon the success of its popular classes. Even with abundant resources, securing the necessary facilities for advanced work is a matter of time; and, if measured by their quantity alone, the results are not striking. No one who has not himself done original work can appreciate the slowness with which results are reached; — the amount of time consumed in preparing for a series of examinations or experiments, in tracing back the literature of the subject, and in controlling and verifying results; — all of which must of necessity be done, although not the investigation proper. To do this presupposes the possession of a more than good library, and of extensive collections — living, pressed, and preserved in alcohol. These must usually be accumulated gradually, as opportunity offers, without reference to present needs, or they are not available when the occasion for their use comes. It is the possession of these facilities, quite as much as the instruction of leaders in science, that tempts the American graduate abroad if he has the ambition to do work in some special direction after leaving college.

A knowledge of what has been done in American botany and a recognition of a part of that which has not been done, together with a study of the tendencies of the times, may not be without value in forming our plans for advanced instruction, as well as that of a more elementary character. It is especially necessary for the former, that we may avoid a waste of energy on that which has already been well done. It has been wisely said that "a reaper cannot expect to cut a full swath, following in the track of another," though the opportunity for the gleaner is far from discouraging in any field of study or research.

Systematic botany so far as the flowering plants of Europe and North America are concerned, is far from being a *terra incognita*, and if, as all botanists pray, Dr. Gray shall be spared to complete his Flora of North America, our entire country will be nearly as well provided for as the Eastern States now are in the Manual, or the Southern States in Chapman's Flora. Yet it must be long before we can hope for a work comparable with Watson's English Topographical Botany, the production of which must result from a faithful study of local floras over the entire country. The study of cryptogams or flowerless plants, as a branch of systematic botany, is still largely to be made. It is more than half a century behind that of the flowering plants; and the multiplied synonymy of American fungi is the strongest argument for increased facilities for training those who are to make this study their life work.

I have already spoken of the value of a knowledge of the life history of these plants in commenting upon the practical applications of botany. To teach what is already known is the smallest part of imparting this. The same remark may be made with equal truth of the physiology of all plants, and of their minute structure as connected with their vital processes. Properly developed, I see in these directions the greatest usefulness in the prosecution of advanced and independent research that this or any American school of botany can aspire to.

To conscientiously further the study of botany in all useful directions, to the extent of my ability and means, is the only pledge of success that I can give. That the many friends of the Shaw School of Botany may see their hopes and mine realized, depends in no small degree upon their own exertions. To give us students who are prepared to do good work and whose ambition is to do their best, to extend the hand of encouragement when progress seems slow and the way hard, and at all times to kindly criticise errors of judgment and execution, is as much their duty as it must be their pleasure. Above all, I would ask that adverse criticism, leading to a loss of confidence, be not hastily passed upon the slowness of growth that is, from the nature of the case, to be expected in much of our undertaking. The oak does not reach its strength and majesty in a night, nor does the mushroom ever attain to the stature of the oak.

At the conclusion of Professor Trelease's address, the following resolution was offered for adoption by the Directors and Faculty of Washington University, and by the audience assembled: —

Resolved, That as friends of advanced education, and as citizens of St. Louis, we gratefully recognize the long continued benefactions conferred by our fellow-citizen, Mr. Henry Shaw, and especially at this time thank him most heartily for his generous action in the cause of scientific study and research. That he may live many years to see the fruit of his labors, and that his last days may be his happiest and best, is our earnest hope and prayer.

The resolution was adopted unanimously by a standing vote.